

CLAIMS

What is claimed is:

1. A fluid flow system to adjust a humidity of a gas supplied in a fuel cell system, comprising:

a fuel cell stack having a cathode inlet and a cathode exhaust;

a compressor that draws in a mixture of fresh gas and humidified exhaust gas from said cathode exhaust and compresses said mixture therein;
and

an injector injecting water into said mixture within said compressor, said compressor supplying said mixture to said cathode inlet.

2. The fluid flow system of claim 1 further comprising a metering device to adjust a flow of said cathode exhaust gas to said compressor.

3. The fluid flow system of claim 1 wherein a rate of cathode exhaust gas flow is controlled to adjust the humidity.

4. The fluid flow system of claim 1 wherein an amount of water injected into said compressor is controlled to adjust the humidity.

5. The fluid flow system of claim 1 wherein a compression pressure of said compressor is adjusted based on an amount of water injected into said compressor.

6. The fluid flow system of claim 5 wherein said compression pressure is adjusted to vaporize said water during compression.

7. The fluid flow system of claim 1 further comprising:
a metering device to adjust a flow of said cathode exhaust gas to an inlet of said compressor; and
a controller that controls said metering device, said injector and said compressor to adjust the humidity.

8. A method of regulating a humidity of a cathode supply gas to a cathode side of a fuel cell stack, comprising:

mixing the cathode supply gas with a feedback gas from said cathode side to effect a relative humidity of the cathode supply gas;

injecting water into the cathode supply gas to further effect said relative humidity of the cathode supply gas; and

compressing the cathode supply gas in a compressor.

9. The method of claim 8 wherein the cathode supply gas is air.

10. The method of claim 8 further comprising vaporizing said water within said compressor.

11. The method of claim 10 wherein said vaporizing is achieved using heat generated through compression.

12. The method of claim 10 further comprising adjusting a compression pressure of said compressor based on a quantity of said water to vaporize said water therein.

13. The method of claim 8 further comprising adjusting a flow of said feedback gas based on a desired relative humidity of the cathode supply gas.

14. A method of regulating a relative humidity of a gas supplied to a cathode side of a fuel cell stack, comprising:

controlling a flow of feedback gas from said cathode side to a compressor to adjust said relative humidity of the gas;

vaporizing water in said compressor to further adjust said relative humidity of the gas; and

discharging the gas at a pressure sufficient for use in the fuel cell stack.

15. The method of claim 14 further comprising injecting water into said compressor.

16. The method of claim 14 wherein said vaporizing is achieved using heat generated through compression.

17. The method of claim 16 further comprising adjusting a compression pressure of said compressor based on a quantity of said water to vaporize said water therein.

18. The method of claim 14 wherein said feedback gas is saturated.

19. The method of claim 14 wherein said feedback gas is super-saturated.

20. A method of regulating a relative humidity of a gas, comprising:
controlling a flow of feedback gas to a compressor to adjust said relative humidity of said gas; and
vaporizing water injected into said compressor to further adjust said relative humidity of said gas.

21. The method of claim 20 wherein said feedback gas is saturated.

22. The method of claim 20 wherein said feedback gas is super-saturated.